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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/576,997	04/25/2006	Michalakos Averkiou	US030442US	7249
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EXAMINER				
MEHTA, PARIKHA SOLANKI				
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.



### Office Action Summary

**Application No.**

10/576,997

**Applicant(s)**

AVERKIOU ET AL.

**Examiner**

PARIKHA S. MEHTA

**Art Unit**

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 11 December 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,3-5 and 7-12 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3-5 and 7-12 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 April 2006 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB-08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_



## DETAILED ACTION

### *Drawings*

1. The drawings are objected to because the boxes in Figure 6 are not adequately labeled; the numerical labels are not sufficiently descriptive so as to effectively depict the invention. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### *Specification*

2. The title of the invention is not descriptive. A new title is required that is clearly indicative of the novel feature(s) of the invention to which the claims are directed. Examiner also notes that the word "system" should not appear in the title, as the claims are only directed towards methods.

### *Claim Rejections - 35 USC § 112*

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:
- The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
4. Claims 3, 5, 9 and 10 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.



Claim 3 recites the limitation "the steering directions" in line 4. There is insufficient antecedent basis for this limitation in the claim.

Claim 5 recites "transmitting broad beams...comprises transmitting a sequence of focused beams". It is unclear how transmission of a focused beam can constitute transmission of a broad beam, as the two terms are contradictory.

*Claim Rejections - 35 USC § 103*

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 1, 4, 8, 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's admitted prior art in view of Brock-Fisher et al (US Patent No. 5,577,505), hereinafter Brock-Fisher ('505), of record.

**Regarding claims 1, 4 and 11,** Applicant admits that it is known in the art to transmit a single plane wave of microbubble-destroying ultrasound into tissues encompassing a first area, repetitively transmit a plurality of beams of imaging ultrasound having an intensity insufficient to destroy microbubbles into the tissues, receive reflections from each of the imaging ultrasound beams, and process the received reflections over a sufficient period to allow reperfusion of the tissues to provide an ultrasound perfusion image (Specification p. 3 paragraph 2, p. 4 paragraph 1). The admitted prior art does not expressly teach that the imaging ultrasound has a second area smaller than the first area, or that the received beams have a third area that is smaller than the first area. In the same field of endeavor, Brock-



Fisher ('505) teaches that decreasing the size of the transmit aperture (i.e., transmit "area") is effective to decrease transmit power (col. 2 lines 60-67). As such, it would have been obvious to one of ordinary skill in the art at the time of invention to have performed the admitted prior art method by transmitting the imaging beam at a smaller area in order to achieve the step of transmitting at a power insufficient to destroy the microbubbles, in view of the teachings of Brock-Fisher ('505). A skilled artisan would also recognize that, if the imaging transmit beam is of a smaller area, it would be necessary to transmit multiple imaging beams over the interrogation area (i.e., a plurality of second areas which substantially encompass the first area) in order to obtain a complete image of the area of interest.

**Regarding claim 8**, the area of a reflected ultrasound beam is inherently proportional, i.e. "substantially" the same as, the area of the transmit beam from which it is generated.

**Regarding claim 12**, the admitted prior art plane wave constitutes a "broad beam" of ultrasound.

8. Claims 3, 5, 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Krishnan (US Patent No. 6,340,348), hereinafter Krishnan ('348), of record, in view of Applicant's admitted prior art and Brock-Fisher ('505).

**Regarding claims 3 and 5**, Krishnan ('348) teaches transmitting a plurality of broad beams of differently steered microbubble-destroying ultrasound at a sufficiently high rate such that a subsequent beam is transmitted before a previous beam is received (Examiner notes that "broad" is a relative term), repetitively transmitting a plurality of imaging ultrasound beams having an intensity insufficient to destroy microbubbles into the tissue, and receiving reflections from each of the transmitted ultrasound imaging beams (col. 3 line 51- col. 4 line 5, col. 5 lines 15-22, col. 9 lines 33-45).

Krishnan ('348) does not expressly teach the step of processing the received reflections over a sufficient period to allow reperfusion of the tissues to provide an ultrasound perfusion image. Applicant admits that such steps are known in the art (Specification p. 3 paragraph 2). It would have been obvious to one of ordinary skill in the art at the time of invention to have modified Krishnan ('348) to also include processing the received reflections over a sufficient period to allow reperfusion, as taught in the admitted prior art, in order to use the method of Krishnan ('348) for perfusion imaging.

Neither Krishnan ('348) nor the admitted prior art expressly teach that the transmit and received imaging beams are of areas smaller than the area of the destruction beam. In the same field of endeavor, Brock-Fisher ('505) teaches that decreasing the size of the transmit aperture (i.e., transmit "area") is effective to decrease transmit power (col. 2 lines 60-67). As such, it would have been obvious to one of ordinary skill in the art at the time of invention to have performed the method of Krishnan ('348) and the



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admitted prior art method by transmitting the imaging beam at a smaller area in order to achieve the step of transmitting at a power insufficient to destroy the microbubbles, in view of the teachings of Brock-Fisher ('505).

**Regarding claim 9**, Krishnan ('348) teaches setting the beam focus (col. 4 lines 35-38).

**Regarding claim 10**, Krishnan ('348) teaches transmitting the destruction beams in different directions (col. 5 lines 15-22).

9. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's admitted prior art and Brock-Fisher ('505) as applied to claim 1 above, and further in view of Hwang et al (US Patent No. 5,706,819), hereinafter Hwang ('819), of record.

Neither the admitted prior art nor Brock-Fisher ('505) teach that the imaging ultrasound is transmitted at a first frequency and the reflection beams are received at a harmonic of the first frequency. In the same field of endeavor, Hwang ('819) teaches that receiving reflected ultrasonic beams at a harmonic of the transmit frequency is useful for clutter rejection (col. 1 lines 42-43). It would have been obvious to one of ordinary skill in the art at the time of invention to have performed the methods of the admitted prior art and Brock-Fisher ('505) by receiving the reflected image beams at a harmonic of the transmit beam frequency, in view of the teachings of Hwang ('819).

### ***Response to Arguments***

10. Applicant's arguments with respect to claims 1, 3-5 and 7-11 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to PARIKHA S. MEHTA whose telephone number is (571)272-3248. The examiner can normally be reached on M-F, 8 - 4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian Casler can be reached on 571.272.4956. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.



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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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3737

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